rapture inspired by the sight of a company of Sea-Swallows or Terns as they pass along the shore with their graceful, dancing flight. Not so very long ago this delightful spectacle might be witnessed in numerous places, and there were many spots to which the observer might be led where he could, if so minded, be entertained for hours by watching their aërial evolutions, for these were the chosen homes of these beautiful and wholly harmless creatures. There, on secluded sand-hills, among the campion or the marram, could be found their nests, with the variously tinted and spotted eggs or the mottled down-clad young; while on the bare shingle itself might be discovered by the trained eye the slight hollow containing the progeny of the smallest and most delicate species of the genus. In days anterior to the Close Time Acts these spots were commonly the scene of useless and brutal outrage on the part of the gun-bearing miscreant; and even now it is evident that their sequestered position tempts the person who miscalls himself a naturalist, but is generally a trafficker in "plumes," to deeds of blood which he would be ashamed to own in decent society. There is at present scarcely any kind of native bird that needs protection more strongly than the confiding Tern and all his kind. Its home is on the shore, which is free to all men—be they honest or murderers—and it enjoys none of the protection which the law of trespass affords to birds which nest on land belonging to some definite proprietor. It is plain, from the caution Mr. Southwell shows in not naming localities, that he believes, and we think with reason, the prolonged existence of Terns on the Norfolk coast to be perilous in the extreme. For ourselves, we cannot see why it should be in the power of any man—be he a blackguard or only a blockhead—to deprive his fellow-men of one of the most delicious sights of the sea-coast, simply because, by the common law of England, the foreshores are the property of the Crown, and he chooses to desecrate them for his own selfish purpose.

Those who study this volume will, however, find in it much more than has been indicated by the preceding remarks. The portions relating to Swans will prove good reading to persons of many tastes. The Swans of Norfolk, if not so widely known as its Turkeys, deserve as much celebrity, as those will admit who have eaten a fatted Cygnet from the St. Helen's Swan-pit—the only Swan-pit, we believe, in England now in working order. Here we have a good description of it, and, more than that, an account of Swan-upping (*i.e.* the taking up of the young Swans) on the Yare—a very much larger affair than that which attracts Londoners to the yearly Swan-upping on the Thames; while the curious subject of Swan-marks, which has so many charms for the antiquary, is duly if not exhaustively treated. Of more strictly ornithological interest, there is a valuable dissertation, by Mr. Stevenson, on that mysterious entity, the so-called "Polish Swan"—a subject on which Mr. Southwell was already a chief authority, as he was on that of decoys. The treatment of this last topic falling to his lot, he naturally refers his readers to his own papers—in the second edition of Lubbock's "Fauna of Norfolk," and in the second volume of the Transactions of the Norfolk and Norwich Naturalists' Society—for the many particulars which it would have been useless here to repeat

An opinion has obtained among writers of local faunas that it is advantageous to draw up what they are pleased to designate a "strong list"—meaning thereby to enrol as many species in their work as by any excuse, and a liberal extension of the rules of evidence, they could possibly include. Our present authors have gone upon the very opposite plan, and assuredly it is the right one. Instead of welcoming on the slightest testimony every report of the appearance of a misguided straggler, these naturalists of Norfolk have not only required proof positive of the fact, but that its occurrence should be free from the taint of human complicity. Consequently, the list of so-called Norfolk birds has again and again been weeded of all weak members, and whatever be its number, which we have been no more careful to count than has Mr. Southwell, it is obviously to be accepted without hesitation; even stragglers from the Alps or the Antilles, like the Wall-Creeper and the Capped Petrel—the latter being of more general than special interest—since, after the researches of Mr. Ober and Colonel Feilden, at its ancient homes in Dominica and Guadeloupe, there cannot be much doubt that it must belong to the category of extinct species like the Great Auk, the Labrador Duck, the Phillip-Island Nestor, and many others—while the former will always be remembered for the share which Gilbert White, of happy memory, took in certifying its first occurrence in England nearly one hundred years ago, and a *fac-simile* of the drawing of two of its feathers sent to him by Robert Marsham is here given.

We must not conclude our review without mentioning that this third volume of Mr. Stevenson's work contains three beautiful plates by that unrivalled zoological artist, Mr. Wolf, whose labours have now, alas! practically ceased, and these plates are enough to give the book an especial value. That representing the "Gullery" at Scoulton is a picture on which lovers of Nature will for ever fondly dwell. Clever sketches of similar scenes have before appeared; but nothing of the kind approaching the accuracy, or what is called "feeling," has hitherto been published.

The reviewer's grumble, after all this praise, must be finally stated. This work has three faults. It wants a map, showing the localities mentioned and indicating the natural districts of the county, so well described in Mr. Stevenson's introduction, and an index of the local names of the birds; but worse than all, and absolutely destructive to its existence, the third volume is bound with *wire*—wherefore let all buyers of it take warning, and get it out of its case as speedily as possible to save pages so well worth preserving from the effects of corrosion.

SCIENCE WITHOUT TEARS.

The Threshold of Science. By C. R. Alder Wright, D.Sc., F.R.S. (London: C. Griffin and Co., 1890.)

IT was hardly to be expected that a chemist of such scientific distinction as Dr. Alder Wright would undertake to produce a new edition of a well-known popular work entitled "The Magic of Science," which was intended to amuse rather than to instruct its readers. It s therefore not surprising to find that, instead of preparing a new edition of this work, Dr. Wright has compiled the present volume. It represents a compromise between an ordinary text-book written to instruct and a play-book written to amuse. Like most compromises of the kind it is unsatisfactory. It attempts an impossible combination, which fails to satisfy perfectly either those who wish to learn or those who want to play. Dr. Wright refers in his preface to the change in the school curriculum that has occurred during the last thirty years through the introduction of physical science, and he is in sympathy with those who are anxious to arrange a course of instruction suitable for the mental education of boys and girls, most of whom may not become physicists or chemists, or indeed follow any profession in which physical science has a special application. Dr. Wright quotes with approval a part of the second Report of the British Association Committee on Teaching Chemistry, in which stress is laid on the importance of teaching children the science of common things instead of trying to make them learn systematic chemistry and physics. He thinks that this book, which he has named "The Threshold of Science," will to some extent furnish such a course of instruction, while at the same time it will serve to amuse its readers.

"The object is to provide a kind of 'play-book,' which, in addition to affording the means of amusement, shall also to some extent tend in the direction of that course of mental education advocated by the British Association Committee; so that, whilst the juvenile philosopher finds pastime and entertainment in constructing simple apparatus and preparing elementary experiments, he may at the same time be led to observe correctly what happens, to draw inferences, and make deductions therefrom."

While there is no doubt some truth in this statement, as we shall have occasion to point out later, yet it must be clearly understood that this book is not suitable for use in schools. In certain cases it may serve in leisure time as a useful supplement to the systematic instruction of the school, particularly by arousing interest in experimental work, but it can never in any case form a substitute for it. The fatal objection to the book from the educational stand-point is the want of method in its arrangement. Dr. Wright tells us that "not being written with a view to aid in 'preparing for examinations,' nor in accordance with any particular syllabus of requirements, the subject-matter is not arranged in any specially methodical order." The experiments often have no logical connection with each other, and the explanations given of them are frequently so meagre that their educational value is extremely small. The book (of 390 pages) is divided into nine sections, which nominally relate to the "States of Matter," "Physical Changes of State due to Heat and Pressure and not accompanied by Chemical Action," "Changes of State due to Solution not accompanied by Chemical Action," "Solution and Separation from Solution by Actions involving Chemical Changes," "Chemical Actions producing Change of State without the Employment of Solvents," "Physical Adhesion and Allied Phenomena of Surface Action," "Effects of Heat upon Bodies, other than Change of State and Production of Chemical Action," "Radiant Action—Visible Light," "Radiant Action—Invisible Light." Under these sections are described a variety of experiments, many of them quite popular in the sense that while they are easy to make if the directions given are closely followed, it is impossible for a boy who knows no chemistry or physics to fully comprehend the nature of the changes that have taken place. For example, Experiment 13 (in all 404 experiments are described) enables a boy "to produce a gas smelling like rotten eggs by double decomposition." Iron sulphide is decomposed by hydrochloric acid. Anyone will be able to produce the gas, but if he is ignorant of chemistry he will not be much wiser for the information "that double decomposition will take place, resulting in the evolution of the gas hydrogen sulphide whilst the complementary product iron chloride will remain in solution." If physical science is to serve the purpose of an educational instrument, the principal object of making experiments should be to discover facts and verify suppositions. It is only when the learners are put, as far as possible, in the attitude of discoverers that the scientific method of reasoning is acquired. In schools, at all events, there should be no indiscriminate and haphazard experimenting.

The unmethodical character of the book, which unfits it for scholastic purposes, might seem to recommend it as a play-book. But its style is far too didactic for such a purpose, and some of the experiments are too difficult, others too costly, or for various reasons unsuitable. It would be decidedly unsafe to allow boys, unfamiliar with chemistry, to perform many of the experiments described in this book except under competent supervision, the necessity for which is, however, not alluded to. Experiments with hydrogen sulphide, chlorine, bromine, cyanogen, and other poisonous substances, should be excluded from a book which may be used by irresponsible boys who have previously received no chemical instruction and who are bent on amusement or mischief. The production of luminous writing on a wall by means of a stick of phosphorus "held by a towel or pair of tongs" is an operation by no means to be generally recommended, any more than are other experiments with phosphorus—the smearing of the face and hands with a solution of phosphorus in oil, the manufacture of "Fenian fire," a name given to its solution in carbon disulphide—all of which are attended with considerable danger to the inexperienced. The highly ingenious device for setting a "pond or bucket of water on fire," by means of potassium and ether contained in a jar which is plunged into the water, is another operation not free from danger in unskilled hands. The preparation of dry ammonia gas, its collection over mercury, and the demonstration of its absorptibility by ice, are operations far too difficult for a beginner to perform by himself, even if the cost of the mercury were not a hindrance. The same may be said of many other experiments.

So much by way of criticism. It seemed necessary in the interests of science to insist that the book (for which a less ambiguous title might have been found) is unsuitable for schools, and in the interest of those who may use it as a play-book that some supervision and previous chemical knowledge are desirable.

For a boy who is receiving systematic instruction in physical science at school, and whose experimental performances at home can be to some extent supervised, the book is admirably adapted, and such a boy will find it a fascinating as well as an instructive holiday companion.

The volume, on which Dr. Wright has evidently bestowed great pains, contains an astonishing amount of useful and accurate information about common things, and the extreme ingenuity of many of the experiments deserves the highest praise. Teachers of elementary science will find in it much that is suggestive; and many of the experiments, sometimes slightly modified, might be profitably incorporated in a school course.

A work on the "Threshold of Science" in the educational sense of the phrase has yet to be written. The task is a difficult one, and very few men have the originality, knowledge, and scholastic experience which are alike necessary for its accomplishment. Owing to several circumstances, the value of instruction in the methods of acquiring "natural knowledge" has not been fully recognized in the school curriculum. It cannot be expected that much general progress will be made until teachers are provided with a book of this kind adapted for use in public schools. WYNDHAM R. DUNSTAN.

THE ZOOLOGICAL RECORD FOR 1889.

The Zoological Record for 1889. Edited by Frank E. Beddard. (London: Gurney and Jackson, 1890.)

THIS, the twenty-sixth volume of the "Record of Zoological Literature," is published by the Zoological Society of London, and we have to congratulate the Secretary and Editor on the volume having been published well within the year 1890, the literature of which it treats belonging to the year 1889. Possibly this welcome acceleration in publication may be in some measure due to the freshness of the recorders, to whom we would, however, venture to suggest that work of this nature, the value of which depends so greatly upon its accuracy, may be too hastily done. We are too thankful for what we have received to be in a fault-finding mood; yet a very superficial glance over this volume reveals some evidence of a want of care which it would be right, and we think easy, to avoid.

Some changes have taken place in the recorders, the work done last year by Mr. W. E. Hoyle being divided, Mr. P. C. Mitchell taking the Mollusca, Mr. O. H. Latter taking the Brachiopoda and Polyzoa, and Mr. S. J. Hickson the Cœlenterata.

The record of "General Subjects," compiled by Mr. J. A. Thomson, is a feature added to the programme, as carried out under Dr. Günther and the Zoological Record Association, and to a certain extent it supplies a deficiency, nor could it be in better hands than those of the present recorder; but, in order that there shall be as little as possible of duplicate references in the volume, the Editor-in-chief should keep a watchful eye that works that are of right treated of under the special subjects are not unnecessarily referred to here. Thus we think, for an example, that Ecker's "Anatomy of the Frog" need not have been quoted twice, under text-books in the "General Subjects," and under Ecaudata in the record of Reptilia and Batrachia; nor need Mr. A. G. Butler's paper on "Insects supposed to be distasteful to Birds" have been quoted in full three times (General Subjects, Aves, and Insecta), and there are very numerous instances like this. Such records serve little other purpose than to test the powers of the recorders. The "Record" is not a subject catalogue.

A more serious objection may be taken to the departure from uniformity in the arrangement of the memoirs in the record of the Reptiles and Batrachians, and of the Fishes, where, instead of the authors' names being arranged alphabetically, they are printed as they turned up in the recorders' notes; perhaps, as a very trifling blemish, may be mentioned the occurrence of the footnote indicating that the recorder had not seen the work indicated by an asterisk, which notice is not always attached to each record, and in some cases it is attached when not needed. The record of Insecta is a wonderful piece of work, with its 849 references in chief. Here, too, the most useful method of numbering all the papers is adopted, so that a reference is found with a minimum of trouble.

The index to genera recorded as new in this volume is most unfortunately incomplete; by some oversight the whole of the new genera to be met with among the Cœlenterata have been omitted. It may be also noted that the new forms described among the Alcyonaria in the "Narrative of the Cruise of the *Challenger*" have never as yet been alluded to. There was not a column for "Travels and Faunistic" in the volume for 1885, the year in which the "Narrative" was published, and probably the fact that new genera and species of Alcyonaria were described in it escaped the notice of the then recorder of the group; but they were also unnoticed in the "Record" for 1887; and in the volume now under notice they are again passed by, so that no trace of such remarkable genera as Callozostron, Strophogorgia, &c., will be found in the whole series of records.

We have called attention to these defects, as they may be easily rectified in future volumes, and because we think they are of such a nature that the avoidance of them for the future lies in the hands of the Editor. As suggestions, we might add that it is very desirable that, when possible, short but characteristic diagnoses of all the new genera should be given; of course, when these are founded for well-known species, the mere indication of this would suffice, but it would save many a weary search in out-of-the-way journals if such diagnoses of new genera—as, for example, we find in Mr. Hickson's record of the Cœlenterata—were always given, and this used to be the general practice.

OUR BOOK SHELF.

Reports on the Mining Industry in New Zealand. Pp. 209. (Wellington: George Didsbury, Government Printer, 1890.)

THIS volume of reports from the Minister of Mines on the production and condition of mining enterprise in 1889, to both Houses of the General Assembly in New Zealand, is a continuation of similar reports which we have noticed in previous years. As regards the principal items of production there appears to have been a slight increase in gold—203,211 ounces valued at £808,549, against 201,219 ounces and £801,066 in 1888; but the coal raised has diminished by nearly 10 per cent., or from 613,895 tons to 586,445 tons; Kauri gum, which is next in value to gold among the totals, has also diminished from 8482 tons and £380,933 value to 7519 tons worth £329,590. The final result is that the value of minerals raised was £1,493,167 in 1889, or a little less than in 1888, when it was £1,531,614. In addition to the native supply,